

SECTION 230900 - CONTROLS AND INSTRUMENTATION

PART 1 GENERAL

1.1 WORK INCLUDED

- A. New digital system of automatic controls for heat pump and unit heater. Building Automation System (BAS) shall include:
- B. Electric interlock of control system with motors.
- C. Control devices, components, wiring and material.
- D. Power for all control devices provided under this contract.
- E. Instructions.

1.2 RELATED WORK

- A. Section 230500 – Common Work Results for HVAC
- B. Section 230553 – Identification for HAVC Piping and Equipment
- C. Section 233300 – Air Duct Accessories
- D. Drawings – Sequence of Operation

1.3 QUALITY ASSURANCE

- A. Material and equipment shall be the catalogued products of manufacturers regularly engaged in production and installation of automatic temperature control systems and shall be the manufacturer's latest standard design that complies with the specification requirements.
- B. Install system using competent workman who are fully trained in the installation of temperature control equipment.
- C. Single source responsibility of the supplier shall be the complete installation and proper operation of the control system and shall include debugging and proper calibration of each component in the entire system.
- D. Supplier shall have an in-place support facility within 50 miles of the site with technical staff, spare parts inventory and all necessary test and diagnostic equipment.
- E. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Section 15, Governing Radio Frequency Electromagnetic Interference, and be so labeled.

1.4 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01 33 00.
- B. Provide damper shop drawings which show data such as arrangement, velocities, and static pressure drops for each system.

- C. Provide complete operating data, system drawings, wiring diagrams, and written detailed operational descriptions of sequences, and description and engineering data on each control system component. Include sizing as requested. Provide logic diagrams with initial submittals.
- D. At completion of work, submit report of check-out of automatic control system, and as-built control diagrams.
- E. Provide as-built control diagrams for each system, framed under glass for wall mounting.
- F. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND INSTALLERS

- A. Johnson Controls, Inc.
- B. Substitutions: None.

2.2 SYSTEM DESCRIPTION

- A. Provide necessary materials and field work necessary to connect control components factory supplied as part of equipment controlled, unless specified otherwise. Provide differential pressure switches for status indication. Generally, self contained valves, filter gauges, liquid level controllers and similar instructions, are not to be installed under this section.
- B. Unless specified otherwise, provide all new components, fully modulating and proportional. All relays, control devices, transformers and setpoint adjustment shall be contained within the ATC cabinet. Provide pilot positioners for activators which are sequenced with other components.
- C. All operating controllers and set point adjustments shall be contained in a locking control panel. Sensors or transmitter only shall be located in the space on the support column.

2.3 THERMOSTATS

- A. Provide room thermostats with warmer-cooler slide, single temperature, gradual-acting, adjustable sensitivity. Provide covers with exposed set point adjustment, set point indication. Differential not to exceed 2.0 degrees F with minimum 20 F degrees set point adjustment.
- B. Provide manual reset type freeze protection thermostats with 20 foot element located to ensure maximum protection. Provide averaging thermostats for large duct cross-sectional areas.
- C. For remote bulb elements use either averaging type of suitable length for air or rigid bulb type for liquids. Use stainless steel flanges to support elements in ducts. In liquids, use separable wells. Wells for use with automatic temperature control sensors shall be brass wells with 6-1/2 inch long neck where appropriate.

2.4 CONTROL PANELS

- A. Provide local panels of unitized cabinet type for each system under automatic control. Mount relays, switches, and controllers with control point adjustment in cabinet and temperature indicators, pressure gages, pilot lights, pushbuttons, and clocks and switches flush on cabinet panel face.

- B. Fabricate panels from 12 gage furniture steel with baked enamel finish and hinged key lock door.
- C. Mount panels adjacent to associated equipment on vibration free walls or free standing steel angle supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic name plates for instruments and controls inside cabinet and on cabinet face.
- D. Also on this panel, or adjacent wall, mount a framed and glazed control diagram complete with operating instructions.

2.5 CONTROL DAMPERS

- A. Dampers shall be Class 1 as specified in Section 23 33 00. Provide electric operators for all dampers. Provide one motor for each damper section.

2.6 ELECTRICAL WORK

- A. Electrical work shall be provided under this section in accordance with requirements as specified under Division 16. All control wiring exposed to view, in walls or where subject to physical damages shall be run in conduit with compression fittings. Wiring above ceilings may be run free but shall be plenum rated. Provide all relays, switches, wiring, etc. required to accomplish the sequence of controls.
- B. Maximum control voltage shall be 120 volts, provide all necessary control transformers.

2.7 FIELD DEVICES

- A. All devices and equipment shall be approved for installation in Baltimore City.
- B. Temperature Sensors
- C. Dampers
- D. Damper Operators
- E. Freezestats
- F. Electric Thermostats
- G. Control Wiring

PART 3 EXECUTION

3.1 SEQUENCE OF OPERATION

- A. Refer to drawings.

3.2 HARDWARE INSTALLATION

- A. Check and verify location of thermostats and other exposed control sensors with plans and room details before installation. Locate thermostats 60 inches above floor.

3.3 ON SITE TESTING

- A. Provide Engineer approved operation and acceptance testing of the complete system. The Engineer will witness all tests.
- B. Field Test: When installation of the system is complete, calibrate equipment and verify transmission media operation before the system is placed on line. All testing, calibrating, adjusting and final field tests shall be completed by the installer.
- C. Compliance Inspection Checklist: Submit in the form requested, the following items of information to the Owner's Representative and Architect/Engineer for verification of compliance to the project specifications. Failure to comply with the specified information shall constitute non performance of the contract. The contractor shall submit written justification for each item in the checklist that he is unable to comply with. The Owner's Representative and the Architect/Engineer will initial and date the checklist to signify contractor's compliance before acceptance of system.
 - 1. Verify to the Owner's Representative and Architect/Engineer in letter form that supplier has in place support facility. Letter shall show location of support facility, name and titles of technical staff, engineers, supervisors, fitters, electricians, managers and all other personnel responsible for the completion of the work on this project.

3.4 SERVICE AND GUARANTEE

- A. General Requirements: Provide all services, materials and equipment necessary for the successful operation of the entire BAS system for a period of one year after completion of successful performance test. Provide necessary material required for the work. Minimize impacts on facility operations when performing scheduled adjustments and non scheduled work.
- B. Description of Work: The adjustment and repair of the system includes all computer equipment, software updates, transmission equipment and all sensors and control devices. Provide the manufacturer's required adjustments and all other work necessary.
- C. Personnel: Provide qualified personnel to accomplish all work promptly and satisfactorily. Owner shall be advised in writing of the name of the designated service representative, and of any changes in personnel.
- D. Schedule of Work: Provide two minor inspections at 6 month intervals and two major inspections offset equally between the minor inspections to effect quarterly inspection of alternating magnitude, and all work required as specified. Written reports of observations and system condition shall be submitted to Owner and Engineer. Schedule major inspections in June and December. Minor inspections shall include visual checks and operational tests of all equipment delivered. Major inspections shall include all work described for minor inspections and the following work:
 - 1. Clean all equipment, including interior and exterior surfaces.
 - 2. Check and calibrate each field device. Check all analog points.
 - 3. Run all diagnostics and correct all previously diagnosed problems.
 - 4. Resolve and correct any previous outstanding problems.
- E. Emergency Service: Owner will initiate service calls when the system is not functioning properly. Qualified personnel shall be available to provide service to the complete system. Furnish owner with a telephone number where service representative can be reached at all

times. Service personnel shall be at the site within 24 hours after receiving a request for service. Restore the control system to proper operating condition within 3 days.

- F. Operation: Performance of scheduled adjustments and repair shall verify operation of the system as demonstrated by the initial performance test.
- G. Systems Modifications: Provide any recommendations for system modification in writing to Owner. Do not make any system modifications, including operating parameters and control settings, without prior approval of Owner. Any modifications made to the system shall be incorporated into the operations and maintenance manuals, and other documentation affected.

3.5 TRAINING

- A. The Contractor shall provide competent instructors to give full instruction to designated personnel in the adjustment, operation and maintenance of the system installed rather than a general training course. Instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach. All training shall be held during normal work hours of 8:00 a.m. to 4:30 p.m. weekdays as follows:
- B. Provide 2 hours of training for Owner's operating personnel. Training shall include:
 - 1. Explanation of drawings, operations and maintenance manuals.
 - 2. Walk thru of the job to locate control components.
 - 3. Explanation of adjustment, calibration and replacement procedures

END OF SECTION 230900